Since the interlayer insulating film according to the present invention is comparatively thick and can be made flat, conventional troubles caused by steps formed by the underlying lines and the like, such as disconnection on the drain side of the pixel electrode, are overcome. Disturbances in the orientation of the liquid crystal is also prevented. The pixel electrodes and the lines are isolated by the interlayer insulating film formed therebetween. This greatly reduces the number of defective pixels due to electrical leakage between the pixel electrodes and the lines, thereby increasing production yield and reducing production cost. Moreover, according to the present invention, the interlayer insulating film can be formed only by the resin formation step, instead of the film formation step, the pattern formation step with a photoresist, the etching step, the resist removing step, and the cleaning step conventionally required. This simplifies the fabrication process and reduces production cost.

The entire substrate may be exposed to light to allow the remaining unnecessary photosensitive agent contained in the photosensitive transparent acrylic resin to completely react after the light exposure and development of the interlayer insulating film. With this process, an interlayer insulating film with higher transparency can be obtained.

The surface of the substrate before the formation of the interlayer insulating film may be irradiated with ultraviolet light. This improves the adhesion between the interlayer insulating film and the underlying film. Thus, the resultant liquid crystal display device can be stable against further processing in the production process.

The surface of the interlayer insulating film may be ashed in an oxygen plasma atmosphere before the formation of the film of pixel electrode material. This improves the adhesion of the interlayer insulating film and the film of the pixel electrode material formed thereon. Thus, the resultant liquid crystal display device can be stable against further processing in the production process.

The pixel electrodes with a thickness of 50 nm or more can effectively prevent an agent used as a removing solution from permeating from gaps of the film surface into the resin and the resin from expanding due to the permeation of the agent.

The light irradiation time can be shortened and the decoloring efficiency is high by using the i line (wavelength: 365 nm) having higher energy than visible light.

As the aperture ratio of the display improves, the brightness thereof also improves. Accordingly, the viewing angle can be widened by reducing the retardation without degrading the contrast. This makes it possible to obtain a significantly wide viewing angle.

Various other modifications will be apparent to and can be readily made by those skilled in the art without departing from the scope and spirit of this invention. Accordingly, it is not intended that the scope of the claims appended hereto be limited to the description as set forth herein, but rather that the claims be broadly construed.

What is claimed is:

1. A transmission type liquid crystal display device comprising: gate lines; source lines; and switching elements each arranged near a crossing of a gate line and a source line, a gate electrode of a switching element being connected to the gate line, a source electrode of the switching element connected to the source line, and a drain electrode of the switching element connected to a pixel electrode for applying a voltage to a liquid crystal layer, wherein a transparent colorless interlayer organic insulating film, formed from a cured organic polymer and having a thickness determined by a light transmittance and a dielectric constant of the film, is provided above the switching element, the gate line, and the source line, said thickness of the transparent colorless interlayer organic insulating film provides a reduced capacitance between said pixel electrode and said gate line or source line, and

said pixel electrode is a transparent conductive film on the interlayer insulating film,

wherein a spectral transmittance of the transparent interlayer organic insulating film has a lower transmittance for blue light than that for green and red light.

2. A transmission type liquid crystal display device according to claim 1, wherein the thickness of the transparent interlayer organic insulating film is 1.5 μm or more.

3. A transmission type liquid crystal display device according to claim 1, wherein the transparent interlayer organic insulating film is a photosensitive resin.

4. A transmission type liquid crystal display device according to claim 3, wherein the transparent interlayer organic insulating film is a photosensitive acrylic resin.

5. A transmission type liquid crystal display device according to claim 3, wherein the transparent photosensitive interlayer organic insulating film is a decolored resin.

6. A transmission type liquid crystal display device according to claim 3, wherein the photosensitive resin is a positive type photosensitive resin.

7. A transmission type liquid crystal display device according to claim 3, wherein the photosensitive resin has a reactive peak at a wavelength of 365 nm.

8. A transmission type liquid crystal display device according to claim 3, wherein the photosensitive resin has a plurality of reactive peak at wavelength of 365 nm, 405 nm or 436 nm.

9. A transmission type liquid crystal display device according to claim 8, wherein the photosensitive resin is an acrylic resin that includes a copolymer having methacrylic acid and glycidyl methacrylate, and a naphthoquinone diazide positive-type photosensitive agent.

10. A transmission type liquid crystal display device according to claim 9, wherein the transparent interlayer organic insulating film is curved.

11. A transmission type liquid crystal display device according to claim 1, wherein the interlayer organic insulating film includes a photosensitive acrylic resin including a copolymer having methacrylic acid and glycidyl methacrylate.

12. A transmission type liquid crystal display device according to claim 1, wherein the transparent interlayer organic insulating film suppresses degradation by resist removing solution used to form the pixel electrode.

13. A transmission type liquid crystal display device according to claim 1, wherein the transparent interlayer organic insulating film has a light transmittance of 90% or more for light within an entire wavelength range of about 400 nm to about 800 nm.

14. A transmissive liquid crystal display device comprising:

gate lines; source lines; and switching elements each arranged near a crossing of a gate line and a source line, a gate electrode of a switching element being connected to the gate line, a source electrode of the switching element connected to the source line, and a drain electrode of the switching element connected to a pixel electrode for applying a voltage to a liquid crystal layer;

wherein said pixel electrode is a transparent conductive film on a transparent colorless interlayer insulating film;

the transparent colorless interlayer organic insulating film, formed from a cured organic polymer, is above the switching element, the gate line, and the source line, the organic insulating film has a thickness determined by a light transmittance and a dielectric constant of the film, and

wherein a spectral transmittance of the transparent colorless interlayer organic insulating film has a lower transmittance for blue light than that for green and red light and the interlayer organic insulating film has a photosensitivity.

15. A transmission type liquid crystal display device according to claim **14**, wherein the thickness of the transparent interlayer organic insulating film is 1.5 μm or more.

16. A transmission type liquid crystal display device according to claim **14**, wherein the transparent interlayer organic insulating film is a photosensitive acrylic resin.

17. A transmission type liquid crystal display device according to claim **16**, wherein the photosensitive acrylic resin is a positive type photosensitive resin.

18. A transmission type liquid crystal display device according to claim **16**, wherein the photosensitive acrylic resin has a reactive peak at a wavelength of 365 nm.

19. A transmission type liquid crystal display device according to claim **16**, wherein the photosensitive acrylic resin has a plurality of reactive peak at wavelength of 365 nm, 405 nm or 46 nm.

20. A transmission type liquid crystal display device according to claim **16**, wherein the photosensitive acrylic resin includes a copolymer having a methacrylic acid and glycidyl merhacrylate, and a naphthoquinone diazide positive-type photosensitive agent.

21. A transmission type liquid crystal display device according to claim **14**, wherein the transparent photosensitive interlayer organic insulating film is a decolored resin.

22. A transmission type liquid crystal display device according to claim **14**, wherein the interlayer organic insulating film includes a photosensitive acrylic resin including a copolymer having a methacrylic acid and glycidyl methacrylate.

23. A transmission type liquid crystal display device according to claim **14**, wherein the transparent interlayer organic insulating film suppresses degradation by resist removing solution used to form the pixel electrode.

24. A transmission type liquid crystal display device according to claim **14**, wherein the transparent interlayer organic insulating film has a light transmittance of 90% or more for light within an entire wavelength range of about 400 nm to about 800 nm.

* * * * *

25. A liquid crystal display device comprising:
a substrate;
an array of transistors on said substrate;
a plurality of gate and data lines connected to said transistors;
an array of pixel electrodes on said substrate;
a plurality of pixel electrodes overlapping at least one of the gate and data lines; and
a photo-imageable insulating layer on said substrate between said gate and data lines and said pixel electrodes at least in the areas of overlap and areas adjacent source electrodes of the transistors;
wherein said photo-imageable insulating layer has a dielectric constant less than about 5.0, and a first group of contact vias defined therein by photo-imaging, wherein said pixel electrodes are in electrical communication with corresponding transistor source electrodes through corresponding contact vias of said first group that are defined in said insulating layer.

26. The liquid crystal display device according to claim 25, wherein the photo-imageable insulating layer is planarized adjacent the pixel electrode.

27. The liquid crystal display device according to claim 25, wherein a pixel aperture ratio is at least about 65%.

28. The liquid crystal display device according to claim 25, wherein the pixel electrode overlaps one of the drain and gate lines up to about 3 μm.

29. The liquid crystal display device according to claim 25, further comprising a semiconductor layer on top of the gate insulating layer.

30. The liquid crystal display device according to claim 25, wherein the semiconductor layer includes intrinsic a-S1.

31. The liquid crystal display device according to claim 25, further comprising a contact layer over the semiconductor layer.

32. The liquid crystal display device according to claim 31, wherein the contact layer includes amorphous silicon.

33. The liquid crystal display device according to claim 25, wherein the thickness of the pixel electrodes is about 1,400Å.

34. A liquid crystal display device comprising:
a substrate;
an array of transistors on said substrate;
a plurality of gate and data lines connected to said transistors;
an array of pixel electrodes on said substrate; a plurality of pixel electrodes overlapping at least one of the gate and data lines; and
a photosensitive resin on said substrate between said gate and data lines and said pixel electrodes at least in the areas of overlap and areas adjacent source electrodes of the transistors, wherein said photosensitive resin has a dielectric constant of about 3.4-3.5, and a first group of contact vias defined therein by photo-imaging,
wherein said pixel electrodes are in electrical communication with corresponding transistor source electrodes through corresponding contact vias of said first group that are defined in said photosensitive resin.

35. The liquid crystal display device according to claim 34, wherein the photosensitive resin is planarized adjacent the pixel electrode.

36. The liquid crystal display device according to claim 34; wherein a pixel aperture ratio is at least about 65%.

37. The liquid crystal display device according to claim 34, wherein the pixel electrode overlaps one of the data and gate lines by about 1 μm or more.

38. The liquid crystal display device according to claim 34, further comprising a semiconductor layer on top of the gate insulating layer.

39. The liquid crystal display device according to claim 38, wherein the semiconductor layer includes intrinsic a-S1.

40. The liquid crystal display device according to claim 38, further comprising a contact layer over the semiconductor layer.

41. The liquid crystal display device according to claim 40, wherein the contact layer includes amorphous silicon.

42. The liquid crystal display device according to claim 34, wherein the thickness of the pixel electrodes is no greater than 1500 Å.

43. A liquid crystal display device comprising:
a substrate;
an array of transistors on said substrate;
a plurality of gate and data lines connected to said transistors;
an array of pixel electrodes on said substrate;
a plurality of pixel electrodes overlapping at least one of the gate and data lines in areas of overlap; and
a photo-imageable insulating layer on said substrate between said gate and data lines and said pixel electrodes at least in the areas of overlap;
wherein said photo-imageable insulating layer has a dielectric constant in a range from about 3.4 to about 3.8, and a first group of contact vias defined therein by photo-imaging, wherein said pixel electrodes are in electrical communication with corresponding transistor electrodes through corresponding contact vias of said first group that are defined in said insulating layer.

44. The liquid crystal display device according to claim 43, wherein the photo-imageable insulating layer is planarized adjacent the pixel electrode.

45. The liquid crystal display device according to claim 43, wherein a pixel aperture ratio is at least about 80%%.

46. The liquid crystal display device according to claim 43, wherein the pixel electrode overlaps one of the data and gate lines by about 1.0 μm or more.

47. The liquid crystal display device according to claim 43, further comprising a semiconductor layer on top of the gate insulating layer.

48. The liquid crystal display device according to claim 47, wherein the semiconductor layer includes intrinsic a-S1.

49. The liquid crystal display device according to claim 47, further comprising a contact layer over the semiconductor layer.

50. The liquid crystal display device according to claim 49, wherein the contact layer includes amorphous silicon.

51. The liquid crystal display device according to claim 43, wherein the thickness of the pixel electrodes is no greater than 1500Å.